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February 15, 2019

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street S.W.
Washington, DC 20554

Re: ET Docket No. 18-295, Unlicensed Use of the 6 GHz Band

Dear Ms. Dortch:

On behalf of NE Colorado Cellular, Inc., dba Viaero Wireless, I am filing this letter in response to the Commission's Notice of Proposed Rulemaking in the above-referenced docket, to consider the deployment of unlicensed WLAN devices in the 5.925 GHz – 7.125 GHz bands used by the Fixed Service.

Viaero is a wireless carrier operating in Colorado, Nebraska, Kansas, Wyoming and South Dakota. We are currently utilizing over 679 licensed microwave paths in the 5.925 – 6.425 GHz band with over 819 channel pairs, as well as over 107 licensed microwave paths in the 6.525 – 6.875 GHz band with over 107 channel pairs.

We primarily serve rural markets, with over 900 base stations in service. The vast majority of these base stations are connected to our core network via microwave radio.

The health, safety and well-being of our customers, who live in overwhelmingly rural areas, are impacted by anything which reduces our ability to provide highly reliable service throughout our network. This includes not only our subscribers but those of our roaming partners, who depend on us to provide service to their customers in areas where there are no, or very few, other carriers.

In over 25 years of operation, we have utilized the excellent frequency coordination services provided by the Commission or its designated frequency coordinators. Anything which would degrade the level of reliability our customers receive is of great concern. Specifically, while the proposal of an Automatic Frequency Coordination (AFC) system and an exclusion zone for the FSS protected receivers initially appear to be viable, the NPRM does not provide a method by which the WLAN access point may communicate to whatever database is utilized to determine operating frequencies. Viaero would oppose any decision that would allow AFC system communications to be conducted on the same frequency bands that are intended to be protected.

Regarding ¶ 25, there would be little if any difference in a centralized model where all data and computations are in a central location or cloud. The WLAN access point would need to provide its location and technical details, including but not be limited to, owner / operator, manufacturer, make, model, transmit power, unique identifier such as SSID, that would be broadcast. The AFC would communicate a list of permissible frequencies based on exclusion zone parameters. A de-centralized model would defeat this purpose as there would be no accountability for data updates, accuracy or interval.

Regarding ¶ 26, the AFC should determine frequency availability using maximum permissible power for the standard-power access point and defined parameters for the exclusion zone. Power level control should follow the LTE power control model in which the minimum power to establish and maintain a link is utilized. This could be done as a bit error rate or frame error rate measurement. Since bandwidth may change based on demand, the AFC should report the range of available frequencies.
Regarding ¶ 28, device registration in the AFC database is necessary for determining the source of harmful interference. Contact information should be provided. Registration information should be entered by a professional installer as is envisioned by the current SAS process for the CBRS band. All registrants must certify the accuracy of the information entered.

Regarding ¶ 30, Given the importance of operating on a non-interfering basis, the devices should verify frequency availability on at least a daily basis. If the AFC system is unavailable, the WLAN access point should cease operations immediately.

Regarding ¶ 32, Security requirements must be in place to ensure that the software within WLAN access points cannot be easily modified to enable operation on frequencies other than those indicated as available by the AFC system.

Regarding ¶ 42, The Commission wisely created FCC Rule Part 101.105(6) which refers to Telecommunications Systems Bulletin 10 for interference guidelines which are utilized by designated frequency coordinators. The frequency coordination process used by designated coordinators has been extremely successful, with interference cases being almost unheard of in our network. Part of the engineering and analysis performed utilizes a combination of C/I (Carrier to Interference) and T/I (Threshold to Interference) metrics to evaluate possible channels for assignment.

The core metric is the C/I ratio and starts with the FSS receiver characteristic. The C/I value varies by receiver manufacturer, channel bandwidth and modulation scheme (See, Exhibit 1). The far end transmitter power, antenna characteristics, near end receiver antenna characteristics and path length all factor into the receiver signal level, <u>but the C/I ratio present at the receiver is the final measure regarding destructive interference.</u>

Regarding ¶ 43, we believe a protection zone based on the C/I values of the victim receiver, receive antenna pattern characteristics and a free space path model as incorporated into an AFC

system offer the best chance for success. This will require knowledge of the victim receiver's bandwidth, modulation scheme, C/I, T/I and any adaptive modulation and space diversity configurations. A 3D terrain data base will be needed to determine the interfering transmitter's location within the victim receiver's antenna pattern. We would propose use of C/I value equal to at least the manufacturers published T/I value for the highest modulation schema utilized, plus some fixed value in the 3 to 6 dB range as measured at the victim receiver.

Regarding ¶ 45, Viaero designs its paths with fade margins that are typically in the 30 – 40 dB range and deploy Hot Standby / Space Diversity configurations in almost all of our paths. The most likely scenario for fading and destructive interference would occur for a long path with the interferer close by and reducing the effective fade margin.

Given the critical nature of the traffic our microwave links carry, we design to a "six nines" criteria based on K values from .5 to 1.333 and configure space diversity antenna accordingly. While the Crane Tables are utilized for rainfall rate and attenuation calculations, it should be noted that these are statistical averages and that intermittent exceedance is not uncommon. Fade margin is the overall safety net which helps to maintain path availability for weather conditions such as excessive rainfall rates, ice accumulation, multipath ducting and some measure of physical damage to the antenna system.

We thank you for the opportunity to provide these comments.

Respectfully,

Thomas W. Burnett

T.W. Burnett
Chief Technical Officer,
NE Colorado Cellular, Inc., dba Viaero Wireless

Exhibit 1

Typical Carrier to Interference Values Based On Bandwidth and Modulation Scheme

Bandwidth (MHz)	30 MHz		30 MHz		30 MHz		30 MHz		30 MHz		30 MHz		30 MHz		30 MHz		30 MHz	
Modulation	QPSK		16QAM		32QAM		64QAM		128QAM		256QAM		512QAM		1024QAM		2048QAM	
Freq. Offset	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)	MHz	C/I(dB)
0	0	17.5	0	22.42	0	25.93	0	29.79	0	31.72	0	35.55	0	37.62	0	39.63	0	44.55
7.5	7.5	16.53	7.5	21.29	7.5	24.1	7.5	29.04	7.5	30.63	7.5	34.97	7.5	36.61	7.5	38.45	7.5	41.89
15	15	15.51	15	19.01	15	22.57	15	27.07	15	28.77	15	33.83	15	34.62	15	36.5	15	40.41
22.5	22.5	8.45	22.5	13.91	22.5	16.88	22.5	21.15	22.5	24.92	22.5	28.12	22.5	28.98	22.5	33.13	22.5	35.3
30	30	-18.63	30	-16.2	30	-14.42	30	-14.16	30	-13.19	30	-10.86	30	-9.64	30	-6.45	30	-5.87
37.5	37.5	-21.55	37.5	-19.56	37.5	-18.1	37.5	-17.14	37.5	-17.07	37.5	-14.22	37.5	-13.24	37.5	-10.52	37.5	-10.05
45	45	-28.66	45	-25.53	45	-22.19	45	-23.07	45	-20.42	45	-17.45	45	-15.48	45	-14.06	45	-12.97
52.5	52.5	-36.24	52.5	-28.91	52.5	-26.77	52.5	-27.32	52.5	-24.32	52.5	-19.69	52.5	-20.11	52.5	-15.48	52.5	-14.03
60	60	-38.41	60	-31.83	60	-31.42	60	-27.5	60	-25.42	60	-20.6	60	-20.35	60	-15.69	60	-15.54